# Crew Resource Management

Situational Awareness
Assertiveness
Decision Making
Communication
Leadership
Adaptability/Flexibility
Mission Analysis

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# What If

*By AEC(AW/NAC) Dan Schwertfager*

Our crew had been operating for a month out of the Manta, Ecuador, forward operating location (FOL). Our missions were in support of Operations Dolphin Archer and Caper Focus.

Our day began with a 0900 preflight for a five-hour reposition flight to NAS Roosevelt Roads, Puerto Rico. The P-3 we were to take back had arrived in the FOL two weeks earlier with a flap-asymmetry gripe, which was fixed with a flap re-rig, followed by a functional check flight. The plane then sat idle for two weeks.

After takeoff, we leveled off at FL230 as the crew began to ponder what the next couple of weeks in Puerto Rico would be like. One hour into the flight, the flap-asymmetry light illuminated with the flaps in the up position. A quick visual inspection verified both flaps were in the full-up position and would not be available for landing. We broke out NATOPS, reviewed the procedures, and began a risk analysis of our situation.

Flaps in the full-up position require higher speeds and AOA for approach and landing, and they create much longer landing distances. We evaluated our options and considered weather, runway numbers, and fuel remaining. Everything favored continuing to Puerto Rico.

As expected, I saw a little fluid but no massive puddles or any sign of a leak.

We try to keep all crew members "in the game" during every flight, and we routinely fire "what if" questions to each other. I thought it was time to toss a question to the crew. I looked out the starboard aft window and asked over the ICS, "What are everybody's thoughts on losing an engine during the rest of the flight?"

During the conversation, the second flight engineer saw a slight reduction in the No. 1 hydraulic quantity from what had been noted during the preflight. I still was in the back of the plane, so I grabbed my cranial and goggles to take a look in the hydraulic service center (HSC). As expected, I saw a little fluid but no massive puddles or any sign of a leak. We once again evaluated our situation and decided to continue. Heck, it's not like the P-3 never leaks.

At the four-hour mark of the flight, at FL230, the pilot thought he saw something flicker on the horizontal-annunciator-lights-panel assembly for the No. 3 engine; the flight station became abnormally quiet. I ran a lights check to see if any lights were burnt out, and I also checked to see if the "flicker" could have been the sun's reflection on the lights panel. As I scanned engine indications and the pilot finished checking the engine nacelle for any external indications, the No. 3 chips light came on for about 15 seconds, then went out. (The chips light means metal particles are on the power section or the reduction-gearbox magnetic plugs.)

The No. 3 engine had no secondary indications of an engine or gearbox failure. NATOPS requires the engine to be shut down when a chips light comes on. If another emergency requiring power exists, the crew may elect to leave the engine running. This bad day was getting worse.

Aircraft pressurization is provided by two engine-driven compressors (EDCs): one on the No. 2 engine and the other on the No. 3 engine. One EDC should be able to maintain pressurization; however, we also had an outstanding gripe in the book for a weak No. 2 EDC. This situation presented a dilemma because, as I mentioned, we were cruising at FL230.

The pilot immediately contacted center and coordinated a descent to help the No. 2 EDC maintain cabin pressurization. Because of our altitude, we kept the No. 3 engine running to help maintain pressurization.

Center initially cleared us to FL150, and we evaluated the remaining EDC's performance. The cabin pressure stabilized at 7,500 feet. The three-engine-at-15,000-feet range chart determined, with the fuel remaining, we would land 1,000 pounds above our on-top fuel requirement.

Once everybody was comfortable with the situation, and no more questions existed, we shut down the No. 3 engine.

In the Orion world, we routinely practice no-flap landings; we also practice three-engine landings. However, we do not routinely practice no-flap, three-engine landings.

All the crew aft of the flight station, who weren't too concerned before, now were trying to find reasons to crowd into the flight station. This rush forward included our one passenger, the FOL maintenance-control chief who had released us "safe for flight."

After what seemed to be an endless list of "what if" questions, and a good old-fashioned, round-table ORM discussion by the flight station (three pilots and both FEs), we decided to set up No. 3 engine for restart. With no secondary indications from the chips light, we agreed it would be beneficial to restart the engine before commencing the approach. We would do a four-engine, no-flap landing. If the No. 3 engine then developed secondary indications and degraded, we would shut it down for good.

Before arriving at the initial approach fix, we reviewed the emergency-landing brief and the no-flap-landing procedures, completed our required checklists, and then restarted the No. 3 engine. All engine indications appeared normal, and we started our approach.

Three miles from the landing threshold, the No. 1 hyd-press light illuminated (Do you recall our earlier slight loss of hydraulic fluid in the No. 1 system?). This light means the No. 1 hydraulic-pump pressure has dropped below the required limits. I secured the No. 1 hydraulic pump after talking with the pilot and verified the integrity of the No. 1 system. The No. 1A pump still worked and we saw no loss of fluid indicated.

After announcing an "all good" to the flight station, we let the crew know everything was OK and flew a textbook, uneventful no-flap, four-engine landing.

After landing rollout, we secured the No. 3 engine, and, during the taxi to our line, the second FE verified the HSC was clear and the integrity of the No. 1 hydraulic pump was intact. The main-power circuit breaker on the main load center had tripped; we reset it, and the pump ran fine. During postflight, the maintenance crew inspected the aircraft and found numerous gripes. The port flap brake was seized, the starboard flap brake had damaged pins, and the flap-asymmetry relay was shorted because of the flap gripe. The metal fuzz found on the No. 3 gearbox-mag plug was non-rejection criteria; a follow-on penalty run yielded no more fuzz. The HSC leak was within limits, and the No. 1 hydraulic-pump circuit breaker, when set, operated normally, and the discrepancies could be duplicated.

Though we train for any of these malfunctions individually, when combined, this situation became an excellent ORM scenario. If we had added a few more malfunctions and a little runway work, we could have completed a fly flight for the junior pilots and my second engineer.

I think this event made the biggest impression on our single passenger, the maintenance-control chief. So many times he signs "safe for flight," then the plane leaves, comes back, gripes are written, and gripes get fixed—the same old routine. But, when he actually got to experience the full effects of an in-flight malfunction, combined with a few problems, and to see the process we go through, he was impressed. After we had finished our postflight, he still was talking about how fluent and methodical it looked. He said we had made it look easy.

AEC(AW/NAC) Schwertfager flies with VP-5.

*One of the ways to mitigate "what if" questions is to decrease our exposure to an existing hazard. In this case, did everything favor a "continued transit?" What about the increased exposure to the chance of multiple malfunctions?—Cdr. Buc Owens, P-3 analyst, Naval Safety Center.*